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MASSAGE, ITS PHYSIOLOGICAL EFFECTS

By ANNA QUINCY CHURCHILL, A.B., A.M.
Dorchester, Mass.

> If trained in skillful ways
> And married to your mind and heart, your hands
> Can execute enduring artistries and soothe,
> If bred to serve, a restless world to rest.
> JOSEPHINE HAMMOND.

It is difficult to give a good definition of a scientific term. When after much thought and study, a definition has been put together, it is discovered that it does not fit all cases. To no term in gymnastic literature have there been attached, in the course of time, so many different meanings as to *massage*. This is because nobody knows where to draw the line between all the exercises, whether active or passive, that exist in medical gymnastics and the exercises of physical training as used in schools and gymnasia for the healthy. But this is not so difficult, for exercises for pathological conditions can be put in the class of medical gymnastics. They are exercises used for medicine, as the term denotes. But having thus separated general gymnastics from medical gymnastics, the task is more difficult to draw a line between massage and medical gymnastics. The term *massage* comes, probably from the Arabic *mass* or *mass'h* meaning to press softly. Translating this word in its strict sense, massage seems to signify a group of procedures best done with the hands, such as friction, kneading, rolling and percussion of the external tissues of the body. But because the joint movements, especially passive exercises thereof, and in many cases also active and resistive movements are often given as part of a massage treatment, the term has come to overlap the field of medical gymnastics to an extent that masseurs and writers on massage cannot agree upon. Cyriax says: "For myself I consider that the word *massage* should be restricted to denote merely Metzger's 'effleurage' 'pétrissage' and 'massage à friction.' " Mitchell defines massage as "a form of passive exercise by systematic manipulation of the body for definite therapeutic ends." But Murrell makes the term include active as well as passive exercises by defining it as "a scientific mode of treating certain forms of disease by systematic manipulation." Broadly speaking, massage is any scientific manipulation executed on the human body with a curative, palliative, or hygienic object in view; and in this sense the term is used in this discussion.

It is not the purpose of this article to describe the manipulations of massage but rather their physiological effect upon the body. Yet before proceeding, it will be instructive to consider briefly the chief manipulations of massage, for which purpose the system of Dr. Albert Hoffa has been chosen. His manipulations are five, *stroking*, or *effleurage; kneading*, or *pétrissage; rubbing*, or *friction;* and *striking*, or *tapotement;* and *shaking*, or *vibration*. His treatment includes, as well, active, passive and resistive movements. In effleurage the hand performing the movement is pressed as tightly as possible to the surface treated and moves in a centripetal direction over the part. Effleurage is the beginning and end of each massage treatment and can be introduced between other movements. Pétrissage consists in a picking up of the muscle to be treated and a squeezing of it. The two parts of the stroke, though distinct, are smoothly blended. Friction consists of pressing with the palm or finger tips, meanwhile describing small ellipsoids, one after another. The skin and superficial fascia are moved upon the underlying parts. Tapotement consists of an elastic striking of the part treated, usually carried out by the fingers of the operator in semi-relaxation, the strokes being quick and springy. Vibration is the only stroke for which the operator holds his arm tense. For this reason it is a difficult and tiring stroke to administer. The hand or fingers being placed upon the part to be treated, the whole forearm is set in rhythmical trembling motion, so that the sensation transmitted is one of quivering.

The movements almost explain themselves. The passive exercises are those carried on by the operator with no effort on the part of the patient. The active exercises are those in which the patient makes the movement himself. The active movement may, however, be modified into assisted active, by the help of the operator, or into restricted active by his restraining pressure.

Massage is used most often for muscles but it is employed also for nerves and for joints. Joint massage is particularly beneficial after dislocations, sprains or fractures. Massage may be used for the viscera, especially for the stimulation of the alimentary canal, or, for example, the heart or the eye.

The physiological effects of massage are those that are gained from exercise. Exercise is the best way to gain these effects, but it is not always possible or desirable. The patient may be immobilized by splints or disease, or he may be too weak to perform for himself the exercises which, if first carried out passively, will later give him the strength to take his exercise himself.

The first effect of massage is, of course, upon the skin which is stimulated directly. From the touch of the operator's hand the patient may receive any or all of the sensations that can be caused in the skin; such as pain, pleasure, warmth, coldness, pressure. Yet these sensations belong equally to the effect of massage upon the nervous system. The effect upon the skin itself is to improve its activity by stimulation of its glands. A dry hard skin may be made moist and pliable by improved action, due to massage, of the sebaceous and sweat glands; while its absorptive function may be made use of for inunction of ointments. The opposite effect can be produced on a skin already too moist, by the use of powder or a drying medium such as alcohol. The nutrition of the skin is improved by massage, not only by improved activity of the glands, but also by augmentation of the capillary bloodflow to the region treated.

Massage has one of its most important effects on the circulatory system. The flow of the blood and lymph is improved both in quantity and speed. And a rapid flow whether in a river, blood vessel or lymphatic, prevents the deposit of particles held in suspension. A free circulation overcomes the influence of noxious substances. As an illustration of this, laborers are able to do active work in an open sewer near which professional men cannot live without becoming sick. In the sewer the oxygen which would keep off the bad effects of the effluvia cannot be increased, but the increased rapidity of circulation, due to muscular work, keeps the laborers in health. The contraction and relaxation of the voluntary muscles assist venous return. When for any reason, these no longer occur, the venous flow languishes and with it, that in the arteries. In such a case massage is valuable to empty the veins and lymphatics by direct centripetal pressure. As has been well said by Kleen, the action is one of a combined force and suction pump. The effect upon the flow in the veins, in their superficial situation, is direct, and it is for this reason that the strokes of massage are given always toward the heart. Some claim that the effect by direct pressure upon the arterial flow is nothing because the arteries are too deeply placed to feel the stroke and because their elastic walls render them less susceptible to pressure than the thinner-walled veins. Others claim that upon the more superficially placed of the arteries massage holds up the flow, only to cause a subsequent rapid rush of arterial blood as soon as the pressure is released, such that the blood stream may be three times as rapid. Whether the arterial flow is effected by direct pressure or not, it is certain that the hands of the masseur, as they press upon the veins, act as peripheral propelling hearts which coöperate with the heart itself, at the center and lessen its work. This diminishes the blood pressure in the arteries but without increasing the frequency of the heart beat. It might seem, at first thought, to have a tendency to weaken the heart muscle to place its work, literally, in the hands of the masseur, but this is not true. By well filling the heart it becomes relaxed to beat more strongly immediately after and force the increased volume of blood over the body. The reason for the improved action of the heart muscle is not due to the necessity for forcing the increased blood content over the body so much as to the fact that the blood has caused a more complete relaxation than usual of the heart muscle. And physiology teaches us that a muscle must relax well in order to contract well. The pressure of massage upon the veins has, then, a beneficial effect upon the venous flow by direct pressure; upon the arterial flow indirectly through the improved venous flow, and perhaps directly by a temporary check to its flow; and finally upon the heart muscle to improve its contractility. The same stroke that does all this, acts simultaneously upon the tissues surrounding the blood vessels, causing a more rapid absorption of natural and pathological products through the walls of the lymphatics and venous capillaries. And finally, massage affects the circulation by stimulation of the vasomotor nerves.

That the lymph stream is improved has been demonstrated experimentally by Ludwig and Lassar. This is important in the treatment of sprains or any other conditions where there is effusion to be absorbed. Friction has been found to be the best of all the strokes of massage for this purpose. V. Mosengeil has proved this experimentally. He injected a mixture of India ink in the knee joints of a rabbit and then treated one joint with massage and not the other. The swelling caused by the injection disappeared in the treated knee and remained in the other. In the treated leg the ink was found to have been dissipated into the centrally lying lymph courses. It is for the improvement of the speed of the lymph flow and to promote its resorption of waste products that joint movements are valuable, in addition to the strokes of massage.

By thus carrying away effete matter, the nutrition of the muscles treated is improved, as well as by the improved flow of arterial blood to them. The tone and strength of the muscles thus improved is still further increased by their actual exercise under direction of the operator. Through the muscles over them, the nutrition and growth of the bones are improved indirectly, due to the improved circulation in the muscles.

The most useful stroke for strengthening the voluntary muscles is tapotement. Effleurage and pétrissage act restoratively on the muscles. Fatigue comes, at least to some extent, from the presence of so-called fatigue substances in the muscles. Among these substances are carbonic acid, lactic acid, and acid phosphate. Physiology teaches us that the removal of the fatigue substances and the influx of fresh blood bearing oxydizable material works restoratively on the muscle. Zabludowsky demonstrated experimentally that effleurage could dispel fatigue, not only as successfully as rest could do so, but in less time. Upon a fatigued arm muscle effleurage was used for five minutes, after which the patient could again work with his arm. Otherwise, at least fifteen minutes rest was necessary before he could do the same amount of work. A certain musical director used to have effleurage for his arm before conducting because after such treatment he could beat time longer without getting tired.

The first effect of abdominal massage is upon the voluntary muscles of the walls, but its most important influence is upon the smooth muscle fibers of the alimentary canal. The glands connected with the digestive tract are stimulated also. Assimilation is increased and in most cases the appetite is improved by abdominal massage. Constipation is relieved, not only by direct pressure on the intestines, especially the large intestine, but also by the improved glandular activity. The latter may be caused, to some extent at least, by stimulation of the nerves of the canal.

Massage produces increased combustion in the tissues, causing carbon dioxide to be given off. The natural result of this is to increase the work of the lungs, making inspiration deeper and expiration fuller. Thus, not even the respiratory system escapes the beneficial effects of massage.

It remains to discuss the effect of massage on the nervous system. The effect upon this system is obtained in two ways, either by strokes directly over the course of the large nerve trunks, for example the supra-orbital or sciatic, or through the nerve endings in the skin, as has been described already. Through both, an influence is exerted to some extent upon the central system. In treatment of the nervous system, more than that of any other, the kind and force of the treatment must be considered. The treatment may have directly opposite effects administered firmly from those caused by gentle strokes. Weak pressure on a nerve arouses its activity, moderate pressure increases it, but still stronger pressure lessens its activity; while a very strong treatment may prevent it altogether. It is certain that treatment of the affected nerve relieves neuralgia. But it is doubtful why this result is gained. It seems possible that firm pressure upon an already stimulated nerve may prevent its activity and thus give the rest that relieves the pain. Such pressure upon a healthy nerve may, however, stimulate it to over-activity and cause an artificial neuralgia. This effect has been produced and whether the reason suggested is correct or not, there is no doubt that nerve treatment must be undertaken with the utmost care and by skilled hands. The effect of massage on the nervous system is communicated to every system of the body. And every massage treatment must influence the nervous system to some extent. The result is usually delightful, sedative and tonic. During massage treatment most patients are in a state of repose. Generally those who relax to their treatment enjoy it and feel gloriously indifferent, and needless apprehensions are dispelled. But without the sympathetic touch the masseur may fail to cause these desirable results and produce, instead, quite opposite effects. The sympathetic touch is inborn and cannot be taught nor explained. It can be improved but it cannot be acquired if it is not there. It is a mystery. But knowledge of the nervous system from every standpoint is more or less shrouded in mystery; as is also the interaction of the nervous system of one person on that of another, whether the influence is carried by the laying on of hands in massage, or in the friendly hand clasp, or across infinite space. But a discussion of the physiological effects should not enter the field of psychology and philosophy.

NECESSITY OF A BACKGROUND

By SARA E. PARSONS, R.N.
Boston, Mass.

Any artist will tell you that the background of his work must be just right or his picture will be a failure. It is a thing to be considered. The background is not the principal part of the picture but it can spoil it. Its purpose is, as I interpret it, to bring into effective relief the rest of the work; in itself it may and probably will be inconspicuous and give no hint of the time and thought expended upon it.

Thus in nursing work actuated by the "professional motive," to quote Florence Nightingale, "is the desire and perpetual effort to do the thing as well as it can be done, which exists just as much in the Nurse as in the Astronomer in search of a new star or in the Artist completing a picture." It seems to me that a nurse often thwarts her object by going at her work in a too haphazard sort of way. Instead of looking ahead and considering what she ultimately wishes to accomplish, she is too apt to accept what offers immediately after graduation without considering whether that will be the best thing in relation to what she hopes eventually to do.